

PHOTONIC BAND GAP OPTICAL FIBER**ABSTRACT OF THE INVENTION**

The present invention is directed toward photonic band gap optical fibers having low optical loss and low optical nonlinearity. According to one embodiment of the invention, a photonic band gap fiber includes a cladding region formed from a photonic band gap structure, the optical energy having a wavelength within the photonic band gap of the photonic band gap structure; and a core region surrounded by the photonic band gap structure. The photonic band gap fiber guides the optical energy substantially within the core region with a loss of less than about 300 dB/km. According to another embodiment of the invention, an optical fiber guides optical energy in a mode having a nonlinear index of refraction of less than about 10^{-18} cm²/W. According to another embodiment of the invention, an optical fiber supports a soliton having a peak power of greater than about 1 MW.